

What are Trend Lines?

A Trend Line is actually an equation of a line

$$Y = mX + b \text{, where } m = \text{slope and } b = Y\text{-intercept}$$

Linear regression is used to minimize the sum of the squared residuals between actual and predicted data points;

If X value is a measure of time, then the equation is considered as trend line, in our case $Y = \text{water use}$. With this equation, future water use can be predicted by using the trend of past water use data.

Introduction

ADWR Water Assessment Industrial Demand Projection Methodology and General Assumptions

Total industrial demand is the sum total of an AMA's industrial subsector demands. Industrial subsectors include the following: Sand and Gravel, Metal Mining, Tuff, Electric Power Generation, Dairies, Feedlots, and the generic catch all category "Other". The three largest AMAs; Phoenix, Pinetop and Tucson have most, if not all, of these subsectors; whereas, the Prescott and Santa Cruz AMAs only have a few.

Three demand scenarios: Scenario One and Scenario Three, were developed for each subsector. Once this was completed, all the similarly categorized subsector demand scenarios were added together to calculate the overall industrial demand scenarios. For example, all the Scenario One subsector demand scenarios were developed using a combination of methods; Trend line analysis and regression analysis (both using MS excel) were generally used to predict future water use if an industrial subsector's historic water use had a strong relationship (generally had an R square value greater than 60 or 70%) to either time or population. Future water use was then predicted by using the trend of past water use as it related to time or population. If population was the X value, future water use was determined by using the projected population for that particular AMA.

Trend line analysis and regression analysis (both using MS excel) were generally used to predict following two methods was used; 1) predictions by AMA or sector professionals or 2) by flat lining average historic water use or current use. Subsectors that are based on a commodity, such as metal mining, generally fit this category.

Trend line analysis wasn't only applied to a subsector's water use. It was also used to study the rate of growth or decline in the number of facilities a subsector had over time. This analysis is especially helpful in detecting when long standing water use trends might be starting to change. It is important to note that ADWR defines an industrial user as an entity that uses water for a non-agricultural purpose and does not receive their water from a municipal source.

The industrial sector predominantly uses their own wells and associated water rights or withdrawal permits. Generally industrial users have their own wells and associated water rights or withdrawal permits. Groundwater supplies can be counted in this sector if they are not supplied by a municipal provider.

Frequently, one or two subsectors dominate and therefore drive the overall industrial demand in an AMA. For instance, turf water demand is the primary driver of the Phoenix industrial demand and in the Tucson AMA it is copper mining.

INDUSTRIAL DEMAND CALCULATOR FOR ARIZONA DEMAND STUDY

Industrial	Analysis.Demand	501	Natural Log of Population	Log(Population)	Natural log of population, used to calculate turf use.	Calculation
Industrial	Analysis.Demand	502	Turf Use	41855.37*[501]-568074.27 AS 502	Turf use in the AMA, calculated based on regression of turf use against natural log of population to account for expected decreasing rate of turf use in response to future population growth..	Historic data (ADWR)
Industrial	Analysis.Demand	503	MWh/yr	Data series	Projected electrical use per capita (in megawatt-hours per year).	EIA Data
Industrial	Analysis.Demand	504	GPMWh	Data series	Gallons-per-megawatt-hour (GPMWh).	EIA Data
Industrial	Analysis.Demand	505	Planning Area Generation Ratio	Data series	Percentage of statewide electrical generation occurring within the AMA.	EIA Data
Industrial	Analysis.Demand	506	Electric Use	[Population]*[503]*[504]*[505]/325851	Projected electrical use in the AMA, based on population, electrical use per capita, gallons per megawatt-hour, and percentage of local energy generation.	Calculation
Industrial	Analysis.Demand	507	Mining Use	Crosstab.[506]	Projected water use for mining purposes. Based on expert survey for Assessment of planned/permitted mining uses; in Phoenix, includes projected additional use by Resolution Copper of 20,000 af/yr starting in 2019.	Assessment > Industrial > Mining
Industrial	Analysis.Demand	508	Other Industrial Use	Crosstab.[508]-Crosstab.[513] AS 508	Projected water use for dairy purposes. Based on expert survey for Assessment; exhibits population-driven decline in response to urbanization	Assessment > Industrial > Dairy

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Industrial	Analysis.Demand	504	gPMWh	Data series	Gallons-per-megawatt-hour (gPMWh).	EIA Data
Industrial	Analysis.Demand	5050	Planning Area Generation Ratio	Data series	Percentage of statewide electrical generation occurring within the AMA.	EIA Data
Industrial	Analysis.Demand	505	Electric Use	[Population]*[503]*[504]*[5050]/325851	Projected electrical use in the AMA, based on population, electrical use per capita, gallons per megawatt-hour, and percentage of local energy generation.	Calculation
Industrial	Analysis.Demand	506	Mining Use	Crosstab.[506]	Projected water use for mining purposes. Based on expert survey for Assessment of planned/permitted mining uses; in Phoenix, includes projected additional use by Resolution Copper of 20,000 af/yr starting in 2019.	Assessment > Industrial > Mining
Industrial	Analysis.Demand	507	Dairy Use	Crosstab.[507]	Projected water use for dairy purposes. Based on expert survey for Assessment; exhibits population-driven decline in response to urbanization	Assessment > Industrial > Dairy
Industrial	Analysis.Demand	508	Other Industrial Use	Crosstab.[508]-Crosstab.[513] AS 508	Water use for various other industrial categories based on expert survey for Assessment, including Sand and Gravel, Feedlots, and Poor Quality; held constant at historical average with the exception of feedlots which decline to zero in response to urbanization as projected in Assessment.	Assessment > Industrial > Sand & Gravel, Feedlot,

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